

What is claimed is:

1. A fluid mixing device for mixing a fluid having a direction of fluid flow, the device comprising at least one mixing element to create at least one vortex adjacent to a surface downstream of the mixing element, the mixing element having a first normal located at a centroid thereof and the surface having a second normal which intersects the first normal at the centroid, wherein the first normal, the second normal and the direction of fluid flow are in a non-planar relationship.
2. The fluid mixing device defined in claim 1, wherein the surface comprises a leading edge.
3. The fluid mixing device defined in claim 1, wherein the surface comprises a trailing edge.
4. The fluid mixing device defined in claim 1, wherein the surface comprises a leading edge and a trailing edge.
5. The fluid mixing device defined in claim 4, wherein the leading edge and trailing edge are substantially parallel.
6. The fluid mixing device defined in claim 5, wherein the leading edge and the trailing edge are interconnected by a wing tip edge.
7. The fluid mixing device defined in claim 6, wherein the wing tip edge comprises an edge substantially parallel to the direction of fluid flow.
8. The fluid mixing device defined in claim 4, wherein the a leading edge and a trailing edge are non-parallel.

9. The fluid mixing device defined in claim 8, wherein the one of leading edge and the trailing edge is substantially perpendicular to the direction of fluid flow.

10. The fluid mixing device defined in claim 2, wherein leading edge comprises a substantially curved edge.

11. The fluid mixing device defined in claim 2, wherein leading edge comprises a substantially straight edge.

12. The fluid mixing device defined in claim 2, wherein trailing edge comprises a substantially curved edge.

13. The fluid mixing device defined in claim 2, wherein trailing edge comprises a substantially straight edge.

14. The fluid mixing device defined in claim 1, wherein the mixing element comprises a planar surface.

15. The fluid mixing device defined in claim 1, wherein the mixing element comprises a curved surface.

16. The fluid mixing device defined in claim 1, wherein the mixing element comprises an apex portion.

17. The fluid mixing device defined in claim 16, wherein the apex portion is oriented to point substantially upstream with respect to the direction of fluid flow.

18. The fluid mixing device defined in claim 16, wherein the apex portion is oriented to

point substantially downstream with respect to the direction of fluid flow.

19. The fluid mixing device defined in claim 1, comprising a first mixing element and a second element.

20. The fluid mixing device defined in claim 19, wherein the first mixing element and the second mixing element are substantially mirror images of one another about the first plane or the second plane.

21. The fluid mixing device defined in claim 19, wherein the first mixing element and the second mixing element are substantially non-mirror images of one another about the first plane or the second plane.

22. The fluid mixing device defined in claim 19, wherein the first mixing element comprising a first leading edge and a first trailing edge.

23. The fluid mixing device defined in claim 19, wherein the second mixing element comprising a second leading edge and a second trailing edge.

24. The fluid mixing device defined in claim 19, wherein the first mixing element comprising a first leading edge and a first trailing edge, and the second mixing element comprising a second leading edge and a second trailing edge.

25. The fluid mixing device defined in claim 22, wherein at least one of the first leading edge and the second leading edge comprise a substantially straight edge.

26. The fluid mixing device defined in claim 22, wherein both of the first leading edge and the second leading edge comprise a substantially straight edge.

27. The fluid mixing device defined in claim 22 , wherein at least one of the first leading edge and the second leading edge comprise a substantially curved edge.
28. The fluid mixing device defined in claim 22, wherein both of the first leading edge and the second leading edge comprise a substantially curved edge.
29. The fluid mixing device defined in claim 22, wherein the first trailing edge and the second trailing edge are integral such that the first mixing element and the second mixing element are interconnected.
30. The fluid mixing device defined in claim 22, wherein the first trailing edge and the second trailing edge are in spaced relation to define an opening between the first mixing element and the second mixing element.
31. The fluid mixing device defined in claim 22, wherein the first leading edge and the second leading edge are integral such that the first mixing element and the second mixing element are interconnected.
32. The fluid mixing device defined in claim 19, wherein the first mixing element comprises a first apex portion.
33. The fluid mixing device defined in claim 19, wherein the second mixing element comprises a second apex portion.
34. The fluid mixing device defined in claim 19, wherein the first mixing element comprises a first apex portion and the second mixing element comprises a second apex portion.
35. The fluid mixing device defined in claim 32, wherein the first apex portion is oriented

substantially downstream with respect to the direction of fluid flow.

36. The fluid mixing device defined in claim 32, wherein the second apex portion is oriented substantially downstream with respect to the direction of fluid flow.

37. The fluid mixing device defined in claim 32, wherein the first apex portion and the second apex portion are oriented substantially downstream with respect to the direction of fluid flow.

38. The fluid mixing device defined in claim 32, wherein the first apex portion is oriented substantially upstream with respect to the direction of fluid flow.

39. The fluid mixing device defined in claim 32, wherein the second apex portion is oriented substantially upstream with respect to the direction of fluid flow.

40. The fluid mixing device defined in claim 32, wherein the first apex portion and the second apex portion are oriented substantially upstream with respect to the direction of fluid flow.

41. The fluid mixing device defined in claim 1, wherein the at least one mixing element comprises a plane.

42. The fluid mixing device defined in claim 1, wherein the at least one mixing element comprises a wedge.

43. A fluid mixing device comprising at least one mixing element for mixing a flow of fluid having a direction of fluid flow, the at least one mixing element comprising a surface having a first normal which is:

- (i) acutely angled with respect to a first plane having a second normal

substantially perpendicular to the direction of fluid flow; and

(ii) acutely angled with respect to a second plane parallel to the direction of fluid flow and orthogonal to the first plane.

44. A fluid mixing device comprising at least one mixing element for mixing a flow of fluid having a direction of fluid flow, the at least one mixing element comprising a surface having a normal which is acutely angled with respect to each of two planes which are orthogonal to one another, each plane intersecting on a line substantially parallel to the direction of fluid flow.

45. A fluid mixing device comprising at least one mixing element for mixing a flow of fluid having a direction of fluid flow, the at least one mixing element comprising a surface having a normal which is acutely angled with respect to a first plane and a second plane which is orthogonal to the first plane, the first plane and the second plane intersecting on a line substantially parallel to the the direction of fluid flow.

46. A fluid mixing device for mixing a fluid having a direction of fluid flow, the device comprising at least one mixing element to create at least one vortex adjacent to a surface downstream of the mixing element, the mixing element oriented in a manner such that a single rotation around its nearest edge to the surface causes the mixing element to become parallel to a tangent to the surface at a point nearest to the mixing element, describing an axis of rotation that is oblique with respect to the direction of fluid flow.

47. A radiation source module comprising the fluid mixing device defined in claim 1.

48. A fluid treatment system comprising the fluid mixing device defined in claim 1.

49. A fluid radiation treatment system comprising the fluid mixing device defined in claim 1.

50. A method for mixing a fluid having a direction of fluid flow, the method comprising the steps of:

- (i) disposing the at least one mixing element in the fluid flow; and
- (ii) positioning the at least one mixing element to create at least one vortex adjacent to a surface downstream of the mixing element such that the mixing element has a first normal located at a centroid thereof and the surface has a second normal which intersects the first normal at the centroid,

wherein the first normal, the second normal and the direction of fluid flow are in a non-planar relationship.

51. A method for mixing a fluid having a direction of fluid flow, the method comprising the steps of:

- (i) disposing the at least one mixing element in the fluid flow; and
- (ii) positioning the at least one mixing element such that a surface thereof has a normal which is acutely angled with respect to a first plane and a second plane which is orthogonal to the first plane, the first plane and the second plane each having an axis of rotation substantially parallel to the direction of fluid flow.